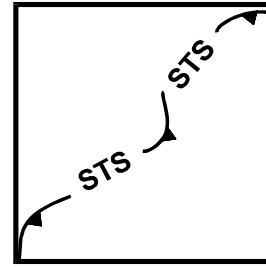
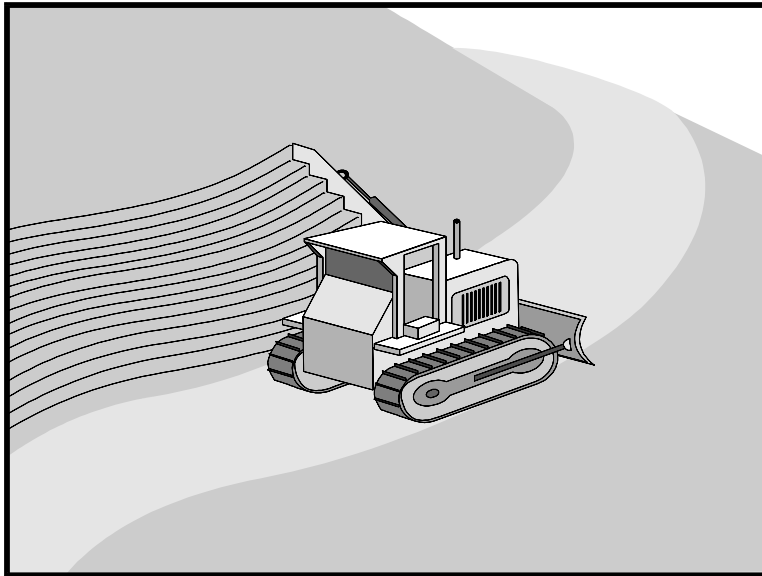


# Slope Roughening/Terracing/Rounding



## BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water

### Definition and Purpose

Roughening, terracing and rounding are techniques used for creating unevenness on bare soil through the construction of furrows, terraces, serrations, stair-steps, or track-marks on the soil surface to increase the effectiveness of temporary and permanent soil stabilization (erosion control) practices. Roughening, terracing and rounding should be used as a permanent measures to prepare a slope to receive permanent vegetation.

Slope roughening or terracing reduces erosion potential by decreasing runoff velocities, reducing the length of sheet flow, trapping sediment, and increasing infiltration of water into the soil. Slope rounding is a design technique used to minimize the formation of concentrated flows.

### Appropriate Applications

- Use on all embankments or cut slopes prior to the application of temporary soil stabilization or permanent seeding.
- Where seeding, planting, and mulching to stabilize exposed soils will benefit from surface roughening, such as graded areas with smooth, hard surfaces.
- Where the slope length needs to be shortened by terracing. Terracing is usually permanent and should be designed under the direction of and approved by the Materials Department based on site conditions. Terraces must be designed with adequate drainage and stabilized outlets for the flow.

### Limitations

- Roughening may increase grading costs and result in sloughing in certain soil types.
- Stair-step grading may not be practical for sandy, steep, or shallow soils,

# Slope Roughening/Terracing/Rounding

---

because these soils with low-stability could easily fail under windy or rainy conditions, resulting in the disappearance of the grading effects.

- Roughening alone as a temporary erosion control or surface preparation measure is of limited effectiveness in intense rainfall events.

**Design Guidance** There are different methods for achieving a roughened soil surface, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading or furrowing, which must be done across the slope and along the contour. Tracking, by contrast, must be done up and down the slope. Factors to be considered in choosing a method are slope steepness, mowing requirements, soil type, and whether the slope is formed by cutting or filling.

## ***Roughening***

- Use stair-step grading or furrows (groove cuts) on slopes that are steeper than 1:3 (V:H). See Figures 4, 5 and 6.
- Use stair-step grading on erodible material which is soft enough to be ripped by a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, with individual vertical cuts no more than 600 mm (24 in) high in soft materials or no more than 1 m (3 ft) high in rocky materials. Slightly slope the horizontal position of the "step" in towards the slope.
- The face of the slope should consist of loose, uncompacted fill 100 mm (4 in) to 150 mm (6 in) deep, from stockpiled topsoil of initial grading.
- Slopes that will be maintained by mowing should be no steeper than 1:3 (V:H).
- To roughen these areas, create shallow grooves by normal tilling, disking, harrowing, or use a cultipacker-seeder. Make the final pass of any such tillage on the contour.
- Make grooves formed by such implements close together, less than 250 mm (10 in) apart and not less than 25 mm (1 in) deep.
- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface. See Figure 3.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not backblade during the final grading operation.

# Slope Roughening/Terracing/Rounding

## ***Terracing***

- Terraces or benches should be designed to be compatible with the geotechnical features of the site. Benches should be at least 6 m wide and sloped to form a valley of at least 0.3 m deep with the low point a minimum of 1.5 m from the toe of the upper slope. Access for maintenance equipment should be provided to the lowest bench, and if feasible to all higher benches. For highly erosive soils, and steeper slopes, the Landscape Architect and the Geotechnical Engineer should be consulted.
- Runoff from terraces and benches should be conducted in lined diversion ditches installed where the terrace meets the slope.
- See Figure 7.

## ***Rounding***

- The tops and toes of all cut slopes where the material is not solid rock should be rounded, both in plan and profile, and should match the adjacent existing conditions. A layer of earth overlying a rock cut also should be rounded. See Figures 1 & 2.

### **Maintenance and Inspection**

Periodically check the seeded or planted slopes for rills and washes, particularly after significant storm events, greater than 1.2 mm (0.5 in). Fill these areas slightly above the original grade, then re-seed and mulch as soon as possible. Avoid use of heavy equipment or machinery as it can damage a newly revegetated slope.

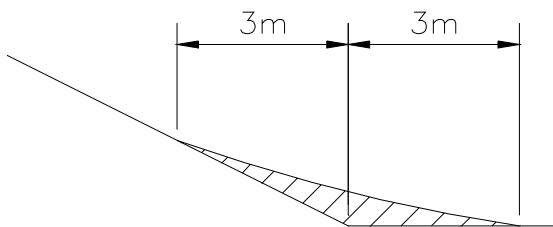


FIGURE 1

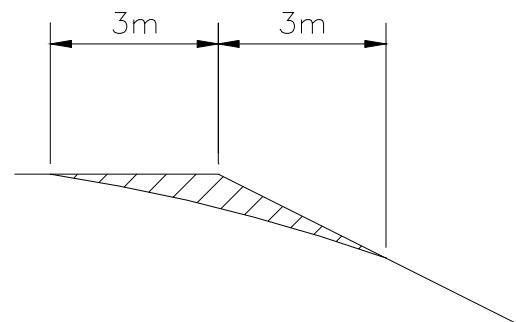


FIGURE 2

## SLOPE ROUNDING

# Slope Roughening/Terracing/Rounding

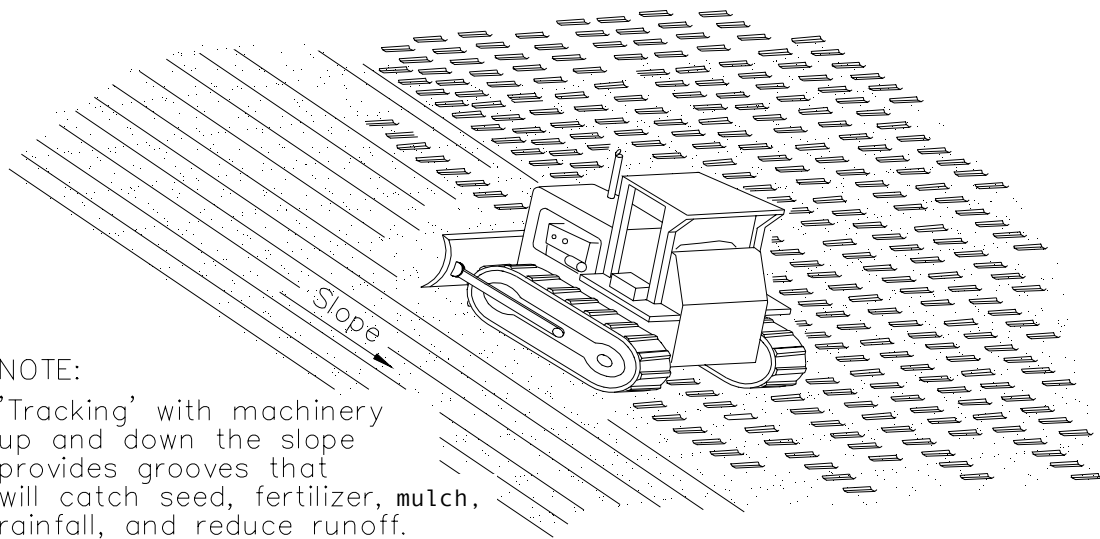


FIGURE 3

TRACKING  
NTS

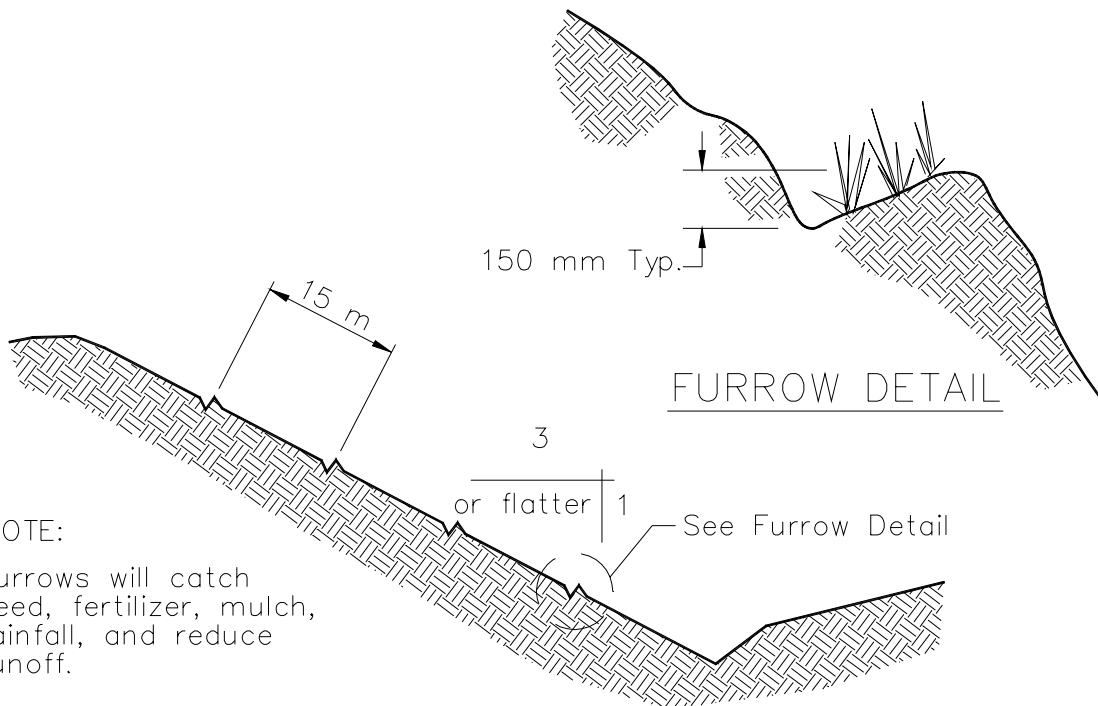
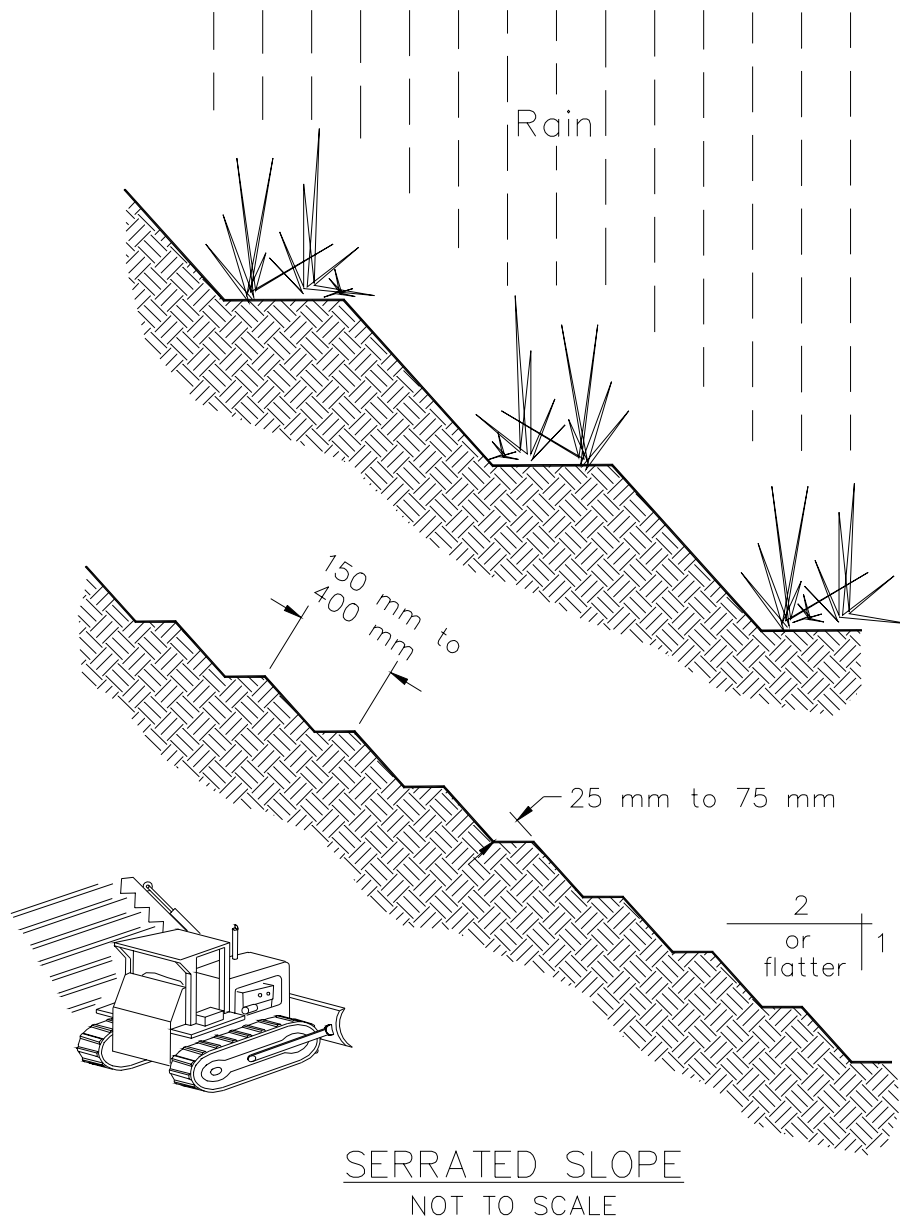


FIGURE 4

CONTOUR FURROWS  
NOT TO SCALE

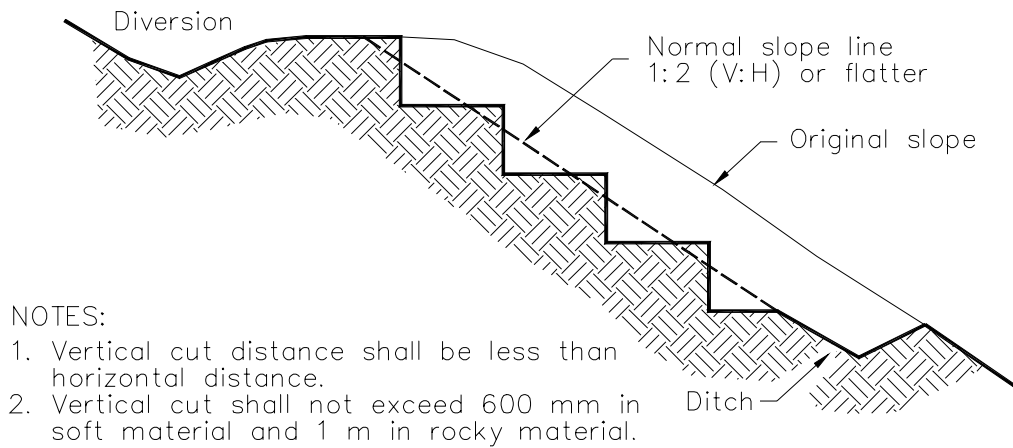
# Slope Roughening/Terracing/Rounding



NOTE:  
Groove by cutting serrations  
along the contour. Irregularities  
in the soil surface catch rainwater,  
seed, mulch and fertilizer.

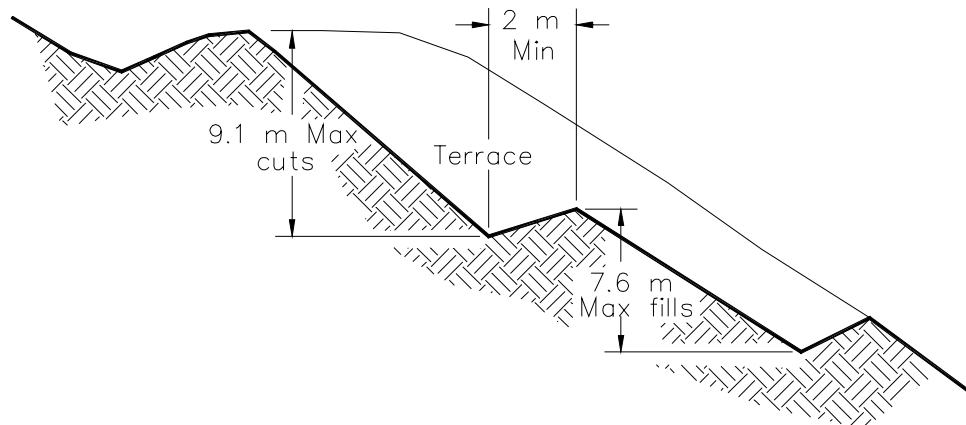
FIGURE 5

# Slope Roughening/Terracing/Rounding



STEPPED SLOPE  
NOT TO SCALE

FIGURE 6



TERRACED SLOPE  
NOT TO SCALE

FIGURE 7